

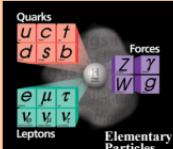
Recent Higgs Search Results from DØ



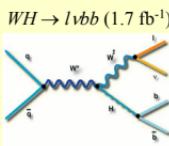
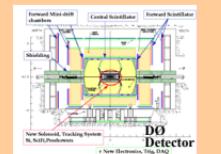
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September 2007

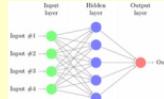


- Higgs is the last Standard Model particle yet to be observed in experiment
 - Through electroweak symmetry breaking, Higgs gives masses to all other elementary particles, with its own mass unpredicted
 - Limit from direct searches at LEP2: $m_H > 114.4$ GeV, indirect limit from precision electroweak measurements: $m_H < 144$ GeV
- A light Higgs is favored, and Tevatron has the potential to see it
- At DØ, Higgs has been searched in various channels



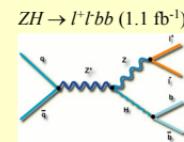
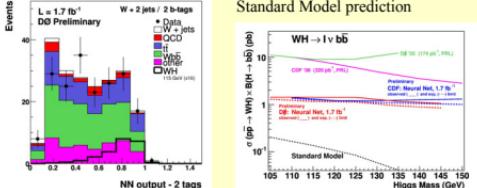
Low Mass Standard Model Higgs

Use Neural Networks
to separate Higgs signal
from backgrounds

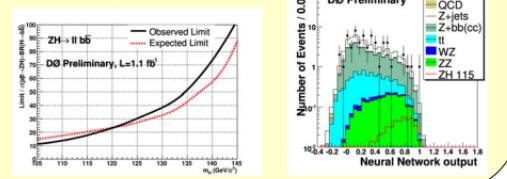


NN output for $WH \rightarrow l v b b$:
signal peaks ~1, backgrounds ~0

Set cross section limits for $WH \rightarrow l v b b$:
for $m_H = 115$ GeV, limit is ~10 times
of Standard Model prediction

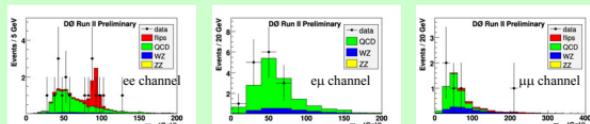


NN output for $ZH \rightarrow l^+ l^- b b$:
separate signal and backgrounds



Intermediate Mass Standard Model Higgs

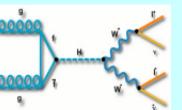
$WH \rightarrow WWW^* \rightarrow l^\pm l^\pm + X (1.0 \text{ fb}^{-1})$



Cross section limits
for $m_H = 140\text{--}160$
GeV are about 20–30
times of Standard
Model predictions

$gg \rightarrow H \rightarrow WW^* \rightarrow l l' \nu \nu'$
(1-1.7 fb^{-1})

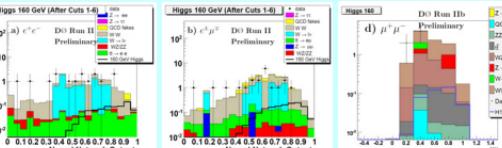
Search in all channels: ee,
eμ, μμ, l+τ



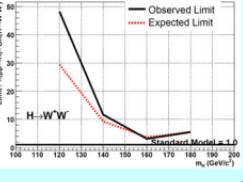
High Mass Standard Model Higgs

$H \rightarrow WW^* \rightarrow l l' \nu \nu'$ for $m_H = 160$ GeV, cross section limit is ~3 times of Standard Model prediction

NN output for $H \rightarrow WW^*$ decaying in ee, eμ, and μμ channels



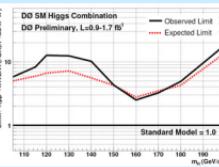
$H \rightarrow WW^* \rightarrow l l' \nu \nu'$ for $m_H = 160$ GeV, cross section limit is ~3 times of Standard Model prediction



Combined Results

Combination of DØ
analyses (0.9–1.7 fb^{-1})

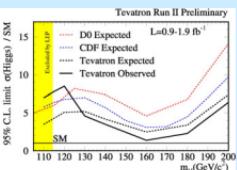
$m_H = 115$ GeV: limit/SM = 8.3
 $m_H = 160$ GeV: limit/SM = 2.5



Combination of DØ and
CDF analyses (0.9–1.9 fb^{-1})

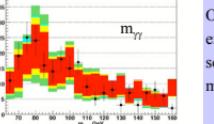
$m_H = 115$ GeV: limit/SM = 7.8
 $m_H = 160$ GeV: limit/SM = 1.4

(Updated results coming soon)



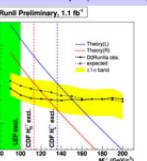
Search for Higgs Beyond the Standard Model

Fermiophobic Higgs $\rightarrow \gamma\gamma$
+ X (1.1 fb^{-1})



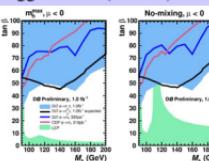
Observed no
excess in data,
so set limit
 $m_H > 92$ GeV

Doubly-charged Higgs
 $H^{++} H^{--} \rightarrow 4\mu$ (1.1 fb^{-1})



Mass limits
 $H_L m > 150$ GeV
 $H_R m > 126.5$ GeV

Supersymmetry model neutral
Higgs $\rightarrow \tau^+\tau^-$ (1.0 fb^{-1})



Excluded region
in Supersymmetry
parameter space

- We search for Higgs at DØ in various channels, for the Standard Model and beyond
- The DØ combined Higgs cross section limits are 2.5 (8) times of the Standard Model prediction, for $m_H = 160$ (115) GeV
- Prospects: DØ will have luminosity of ~6 fb^{-1} by end of 2009, meanwhile will add more channels, and improve sensitivity
- We are approaching the Standard Model Higgs prediction Stay Tuned!